

CLEANER COAL

Bechtel, GE and Duke Energy are teaming up on the largest integrated gasification combined-cycle power plant ever built.



When the first turbine went online at the Edwardsport Power Station in 1918, electricity was mostly an industrial commodity, powering the auto plants and other factories of nearby Indianapolis and Evansville. It would be three years before Chicago's first radio station hit the air and 10 years until the electric shaver was patented.

A great deal has changed in Indiana since 1918, of course. Two new units replaced the original Edwardsport generating unit at midcentury. And while their emissions-control equipment was kept as up to date as possible, the nearly 60-year-old units no longer have the latest emissions technology.

So in mid-2012, Duke Energy will replace the old Edwardsport units with a cleaner-coal power plant just to the south. Built by Bechtel, The \$2.35 billion integrated gasification combined-cycle (IGCC) facility will be one of the world's cleanest and most efficient coal-fired plants. It will generate more than 10 times as much power as the existing facility, but will emit less sulfur dioxide, nitrogen oxides, and particulates, and



about half as much carbon dioxide.

IGCC is a highly efficient, low-emissions technology that makes coal a more environmentally friendly fuel option for utilities. IGCC plants convert coal into gas, removing most of the sulfur and other regulated emissions before the gas fuels combustion turbine-generators. The hot exhaust in turn is used to make steam in heat-recovery steam generators that drive a

steam turbine generator. At Edwardsport, two combustion turbines and one steam turbine will produce a combined 630 megawatts of electricity.

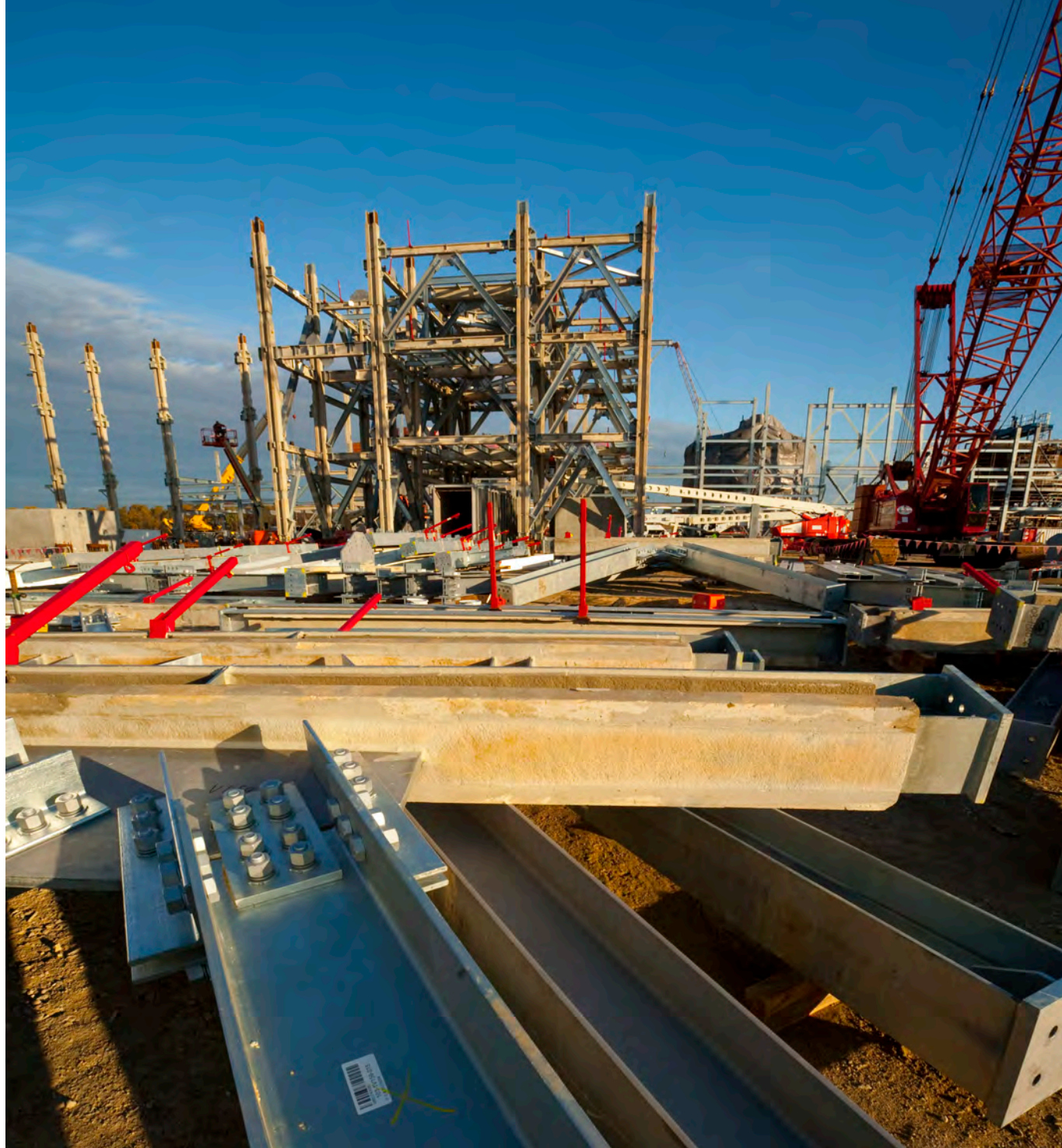
Edwardsport is the first commercial-scale, coal-based IGCC plant built in the United States since Bechtel completed the Polk Power Station in Florida in the mid-1990s. At that time, the U.S. Department of Energy subsidized IGCC as a developmental technology in

hopes of encouraging wider commercial use. But with gas prices low, many utilities selected natural gas instead of coal to power new plants for nearly 10 years.

In 2005, with natural gas prices on the rise and tougher emissions standards on the horizon, Duke Energy began exploring IGCC for its Edwardsport project. Bechtel and GE had just announced formation of an alliance to develop a standard commercial plant for IGCC projects, so Duke asked the alliance to conduct its feasibility study. The study was soon followed by front-end engineering and design, which Bechtel completed in March 2007. Duke secured regulatory approval for the project shortly thereafter, and the job was on.

Under the final agreement, signed in 2008, GE is providing Duke with the process technology design, the gas turbine generators, heat-recovery steam generators, a steam turbine generator, radiant syngas coolers, gasifiers, a turnkey package for the project's air-separation unit, and radiant syngas coolers. Syngas, or synthesis gas, is the fuel fired in the gas turbine to make electricity.

Meanwhile, Bechtel is performing detailed design, procurement, and construction management for the gasification and power islands, as well as sulfur recovery unit process technology. The project also includes extensive new product testing for GE's equipment,





REDUCING THE CARBON FOOTPRINT

With increasing pressure to reduce carbon dioxide (CO₂) emissions from coal, the GE & Bechtel IGCC alliance expects future projects will include CO₂ capture and sequestration capability—a promising option for limiting the greenhouse gas.

The method captures and compresses CO₂ and pipes it into underground geological formations, where it can be permanently sequestered. Many gasification plants have long separated CO₂ from syngas, but have released it instead of capturing it.

In 2009, Duke Energy applied for approval to study the feasibility of constructing a carbon capture and sequestration system for storing a portion of CO₂ emissions from its Edwardsport plant in nearby saline aquifers and in depleted oil and gas fields.

including the first-ever GE turbine of its kind to use syngas. A project team composed of Duke, GE, and Bechtel has also developed a plan for the on-site assembly of two radiant syngas coolers that were too large to transport overland to the site.

The project is the only full-scale IGCC plant being built in the United States today and will be an important technology in years to come.

